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13. ABSTRACT (Maximum 200 words) An epidemiological overview as of 4 June 1984 of the health and effectiveness of women in the Army was done because of the increase number of females in the Army and the historically worse health of females. Trends in morbidity, mortality, and natality are presented and interpreted in terms of projected changes in the future for sex rates of hospitalizations, by diagnostic groups, and for selected mental diseases.					
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EPIDEMIOLOGICAL CONSIDERATIONS REGARDING  
THE HEALTH AND EFFECTIVENESS OF  
WOMEN IN THE ARMED FORCES

ARMED FORCES EPIDEMIOLOGICAL BOARD

FORT DETRICK, MARYLAND

21 JUNE 1984

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I would be remiss if I didn't start with an acknowledgement of a few of my colleagues on this effort. Those closest to the work have been the late Bill Datel, Jess Harris, and Dave Marlowe. Judy Robinson in the Institute's data processing operations, Wayne Lednar of Preventive Medicine for the mortality standardization collaboration, and Scott Morrison of the HSC Patient Administration were quite helpful. All of their efforts are gratefully appreciated.

The driving force for this attempt to take an epidemiologica' overview of the health and effectiveness of women in the Army is the pragmatic interpretation of two bits of data:--the female composition of the predominately male US Army was (and is) increasing, and the health of females has historically been worse than the health of males. What I would like to do in the time available is to cover some of the trends in the more traditional appraisals of health, to mention some

related measures of military effectiveness and to review the current interpretations of the health of females for factors that are likely to change in future Army data.

Let us first look at the female composition of the US Army. In the first figure we see that the ratio of female enlisted soldiers to male enlisted soldiers has been increasing over the last few years and females now exceed ten percent of the enlisted strength. By and large, I shall restrict my discussion to US Army enlisted soldiers though the data seem to be similar for the other services as well as for Officers.

The traditional measures of the health of a population assess mortality, morbidity, and natality. Each of these three areas will be discussed below using Army-wide data except where noted.

#### Mortality

In the United States the death rate is a strictly increasing function of age beyond the early teens. Since the Army consists mainly of young adults in the age range of low death rates, relatively few deaths are expected from this population. Figure 2 shows the age-sex distribution of the US Army enlisted personnel as of 1980. Note that the oldest category does not extend to a very advanced age but only reflects the percentage of enlisted soldiers older than 39. The sex-specific death rates and the indirectly age-race-sex standardized mortality ratios are seen in figure 3. The reduced male ratio and the non-reduced female ratio are potentially

artefactual and a brief discussion of the completeness of standardization may be useful before dealing with the ratios.

Among the obvious differences between the military and civilian populations which could be used for standardization but which are not currently tabulated in the civilian death data are employment and chronic ill-health or physical or mental disability status. The logic behind the use of employment status is the "healthy worker effect" by which the morbidity and mortality of industrially employed individuals has been found to be better than that of the comparable age-sex grouping of the US population. Since everyone "in" the military is employed (by the very definition of being "in"), an occupational health outlook suggests that the military would have lower death rates than the overall civilian population with the exception of military-specific occupational hazards. The military population also differs from the civilian population in that the soldiers have all met the the physical and mental standards for induction into the military. The induction standards were designed to include those capable of performing the tasks required in the military but they also serve to screen out individuals with chronic problems that are at higher risk for death. In addition to employment status and selection, both of which should apply to females as well as males, there are profound differences in the impact of the military as an institution (compared to civilian life) on the health and effectiveness of males and females. We shall return to the psychosocial aspects of the human condition later in the presentation.

The value of 0.52 for the standardized male death ratio can

be interpreted as reflecting the effects of two processes. First, that the unstandardized factors mentioned above and other factors are operating to reduce the male Army deaths to at least the extent that the death rate is lower than the civilian death rate. Second, that the effect of military-specific occupational hazards in increasing the death rate is not greater than the reductions mentioned above. In fact, since the cause of death in soldiers is almost exclusively accidental with very few disease deaths the argument can be made that if the military occupational accidental hazards were as low as those of civilians, then the military death rate would be even lower. In fiscal years 1977 through 1980, disease accounted for, on average, less than 8% of the male soldier deaths and less than 6% for the females.

For the females, the picture is somewhat different. The value of 0.85 for the standardized female death ratio is not statistically different from unity and does not show the reduction attributed to the combination of the healthy worker effect, screening and other factors. The possibility that the death rate was reduced by those factors and then raised by the military occupational hazards is ruled out by the nature of the assignments of females (which excludes them from the more hazardous combat specialties). By comparison to males, the females have a worse mortality experience in the Army because, although their death rate is about the same as age-race comparable civilian females, they do not share with the males the mortality reducing effects of the Army.

#### Morbidity

The female hospitalization rate for all causes in the US Army continues to exceed that for males, figure 4. This is not improving. A more comprehensive measure that takes into account the slightly shorter average length of stay of females compared to males is the non-effectiveness rate (NER) defined as the daily average number of hospitalized soldiers per 1000 strength. When computed separately for males and females and presented as the ratio of female NER to male NER, figure 5, the picture is not different. To get a detailed look at the major contributors to the excess female morbidity, the broad diagnostic categories were rank ordered by the difference in the rates and are presented in Figure 5A as are the rates and the morbidity sex ratios. As is to be expected from this age group, pregnancy related and genitourinary diagnoses are at the top of the list but do not account for the entire sex specific difference. The discussion below will consider the areas of pregnancy related conditions and mental diseases.

#### Childbirth and pregnancy related hospitalizations

Figure 6 shows the recent experience of US Army enlisted females for hospital discharge rates for reproductive related conditions. The majority of these hospital dispositions are for normal deliveries. These data have not been compared with the civilian rates because the appropriate choice of variables to determine the civilian comparison group is not obvious. Among the variables which characterize females with different fecundity are age, race, employment and marital status. There have been changes over time in the characteristics of the females entering the US Army with respect to these attributes, and the marital

status (which is not available in the medical records) frequently changes within the first few years of military service.

Based on a sample of females (all females entering the Army in June of 1977), the childbirth hospitalizations occurred during the second year with the maximum rate occurring in the 13th to 18th month of service. The childbirth hospitalization rate for these females was computed for each major military occupational specialty (MOS) category and is shown in figure 7 (note the change to units of per 100 for this figure). The females in a traditional MOS (for females) had an annual rate of 95 per 1000 while those in the non-traditional MOS had a rate of 55 per 1000 giving a ratio of 1.7. A report from the Navy (Hoiberg, 1982) similarly shows lower pregnancy rates for enlisted females in non-traditional occupations. We shall return to the implications of having a MOS in a traditional or non-traditional area later.

#### Mental Disease

Although mental disease dispositions have been declining, with the exception of a slight increase in 1978 and 1979, figure 8, the female to male ratio seems to be moderately stable, figure 9, with an 11 year average of 1.4. Within mental diseases, the conventional sub-division is between psychosis (of which schizophrenia is the most frequently encountered diagnosis) and all other mental diseases. The sex ratio for psychosis was more variable than the overall rate. The 11 year average value of 1.25 was 11% lower than the total mental disease ratio. Among the non-psychotic mental disease categories, the major contributor to the sex ratio excess was what is now known as

adjustment reaction but was labelled as transient situational disturbance in ICDA-8. The sex ratio averages 2.6 and as seen in figure 10 does not show an obvious time trend.

Suicide attempts represent a highly visible area of mental disease morbidity. Time trends are not available as the reporting of suicide attempts has become mandatory only recently. The sex ratio in the rate of suicide attempts is 5.0 though the rate ratio for suicide deaths was 0.48. That is, on a rate basis there were about five times as many female suicide attempts and about twice as many male suicide deaths.

A study of the mental health consultation service at a basic training center (Spradlin and Butterfield, 1977) showed a sex ratio of three for female to male basic trainee referrals, a ratio of two for mental disease hospitalizations and a ratio of three for separation recommendations.

## EFFECTIVENESS

Turning now to some measures of the functioning of females in the enlisted Army, the following observations are made on various sub-samples of the Army population.

Three bits of data from a study of the June 1977 entering soldiers suggest that females are administratively "less trouble" than males. First, females have about a quarter the rate of males days lost due to AWOL. Second, the average grade for females in their third year is about 5% higher than that for males. And third, females showed a lower fraction of separations



that were "other than honorable". And that's about all of the good news.

Two data points from the June 1977 entering soldiers suggest that females are not well integrated into the normal flow of the Army. First, fewer of the females remained on active duty into their third year. The 3 year attrition amounted to 38.4% for males and 49.2% for females for a female to male "survival" ratio of 0.82. And concurrently, the re-enlistment rate for females was 16% compared to 21% for males for a female to male ratio of 0.77. The attrition at the end of basic training was 8% for both males and females in this group and 12% each in another group the following year. Although the small numbers involved produce some uncertainty in the interpretation, the sex difference in "survival" apparently does not begin to appear until after basic and advanced training are completed.

As reported by Nagomi (1983) the attrition of females entering the Army was 3% higher than males for those soldiers placed in traditional MOS and 11% higher than males for non-traditional MOS in FY76. For FY79, she reports values of 6% and 15% higher attrition for females compared to males in traditional and non-traditional MOS respectively. An excess attrition for non-traditional MOS was also reported from the recent analysis of the National Longitudinal Survey of Youth Labor Market Activity (Waite and Berryman, 1983).

There are two other observations on the June 1977 entering soldiers that may be relevant. First, for the physical profile that characterizes body system functioning ("PULHES"), fewer

females (50%) had complete freedom from limitations, the 111111 "picket fence" profile than males (59%). Second, the same fraction of females as males (91%) started their military careers with no dependents.

A report from a study of the performance of Army units (Savell and Johnson, 1980) examined performance on three day field exercises of units with varying fractions of females. Unit performance was unaffected by the fraction of females in the unit in the range of zero to 35% female fill.

#### Prospects of the Data Changing

There are three factors that appear to be involved in the currently observed Army levels of female health and effectiveness which will be discussed in turn below: The minority status of females, the expansion of female assignments into occupations not traditional for females, and the physical history of the entering females.

The health effects associated with minority status within the Navy have been presented (Hoiberg, 1983) as being consistent with the work of R.M.Kanter (1981) on minority status and "tokens". The internalization of the minority members' emotional state is the assumed mechanism leading to an increase in stress related and other disorders. As you may recall from the Army data covering the past decade, the morbidity sex ratios do not show the same time trend as the personnel strength sex ratio. This suggests that the contribution of minority status is either very small or that the effect is very non-linear. The most

parsimonious interpretation is that the effect is linear and very small.

However there is related evidence that the individual self-esteem changes significantly when the racial minority composition of small groups is increased to the 15% to 20% range. If that reflects a property of small groups in general, then female morbidity could be strongly influenced by the fraction of females in small groups. It is hoped that future research will reveal the relation between minority group composition and morbidity for females in the Army as a part of an anticipated study of the influence of female-female and female-male bonding on unit cohesion and stress.

A more direct assessment of the effects of stress that females encounter in the Army is seen in the measurements reported by Knudsen of the Walter Reed Army Institute of Research (1980) of psychological well being. The worst scores were reported for females in non-traditional assignments and in general, the females in the Army scored lower than civilian females. The reports of anti-female pressures representing gender harrassment are more frequent than the occurrence of sexual harrassment though both are part of the stress that females experience in the Army.

The second factor, that of non-traditional vocations operates through an indirect mechanism. Using the formulation of Marlowe of the Walter Reed Army Institute of Research (1982), exogeneous stressors, including the psychosocial, affect the individual to increase the probability of illness. These stress

response effects are mediated by the individual's social supports which prevent the stress effects from causing illness. Since females in non-traditional vocations will encounter few peers, female oriented traditions, role models, or other social supports, Marlowe's hypothesis that "Women in non-traditional roles have less mediating support within the unit than those in traditional roles." may be the source of the observed morbidity differences as a function of the type of vocation.

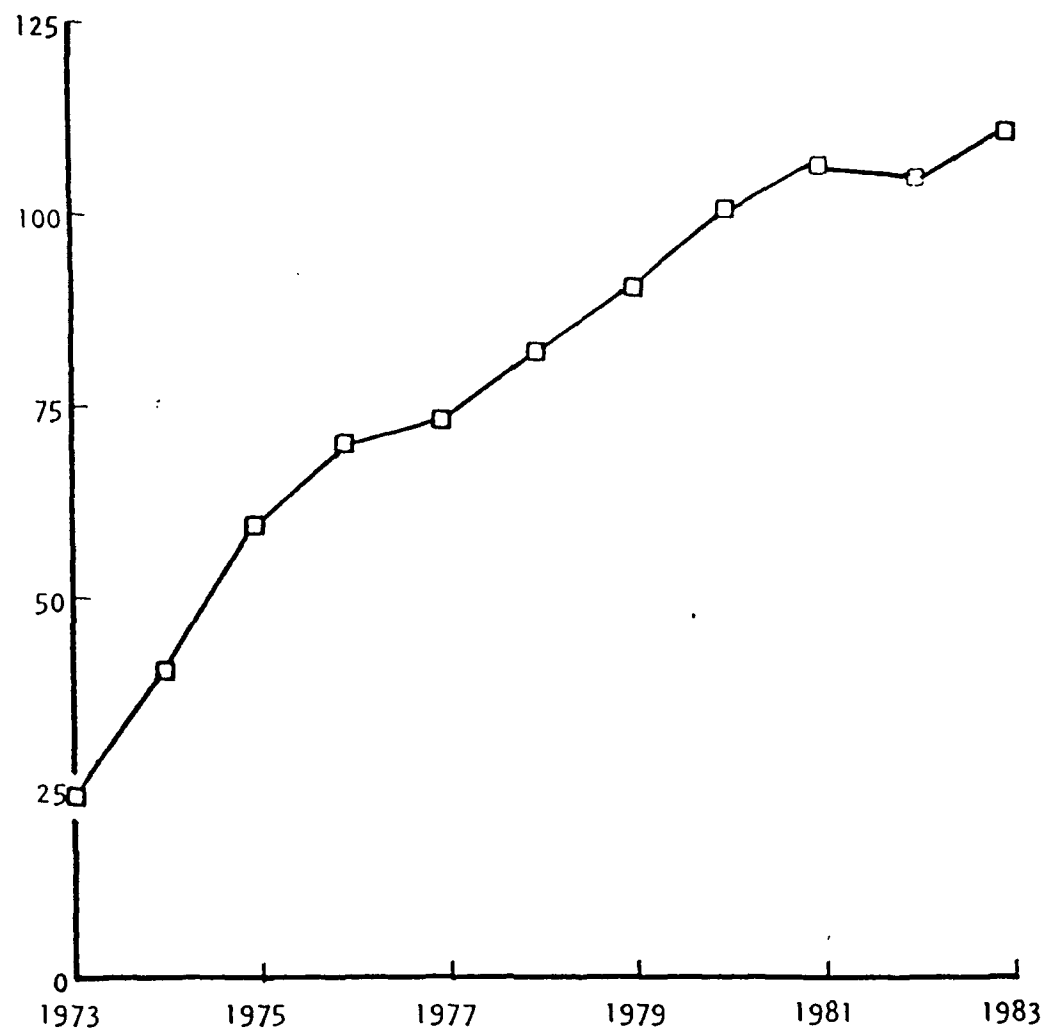
This effect is probably transitory and presents us with an opportunity for a natural "experiment". Assuming that the Army's individual replacement system continues to place females where there already are females, the next vocational generation of females will encounter females on the job, and the job will therefore, no longer be non-traditional for women.

The third factor, the physical condition of the entering females, can be selectively altered by changes in recruiting policies and induction standards. Kowal (1979) observed a 2.1 sex ratio of injuries requiring medical attention in basic training (54% of the females and 26% of the males) and a good correlation of the injuries with poor prior physical condition. This identifies an area in which administrative changes in the induction criteria can alter the observed morbidity.

We have just seen how the one time application of physical standards at induction can influence the morbidity of soldiers in Basic training. Based on the field observations of Lewis of the Walter Reed Army Institute of Research, there is also an informal "screening" process for some of the all male Combat Arms units.

She has observed that some Commanders maintain the physical well being of their unit as a whole by separating from the unit or the Army those troops that drop out of the unit runs three times. Implementation of such a continuous physical fitness criterion for those branches of the Army that contain females would undoubtedly reduce the morbidity sex differentials.

In conclusion, my assessment is that of the three factors discussed, the first will not influence the data, the second is a form of natural 'experiment' and probably represents the most fruitful focus for psychosocial epidemiological research, and the third, although potentially able to influence the morbidity sex ratio, will probably be determined by social policy and manpower market forces rather than medical considerations.



US ARMY ENLISTED STRENGTH RATIO (FEMALE STRENGTH PER 1000 MALE STRENGTH).

Figure 1  
Source: J.M. Rothberg,  
"...Health and Effectiveness  
of Women in the Armed Forces"  
AFEB, FtDetrick, 21 Jun 1984

UNITED STATES ARMY ENLISTED, 1980

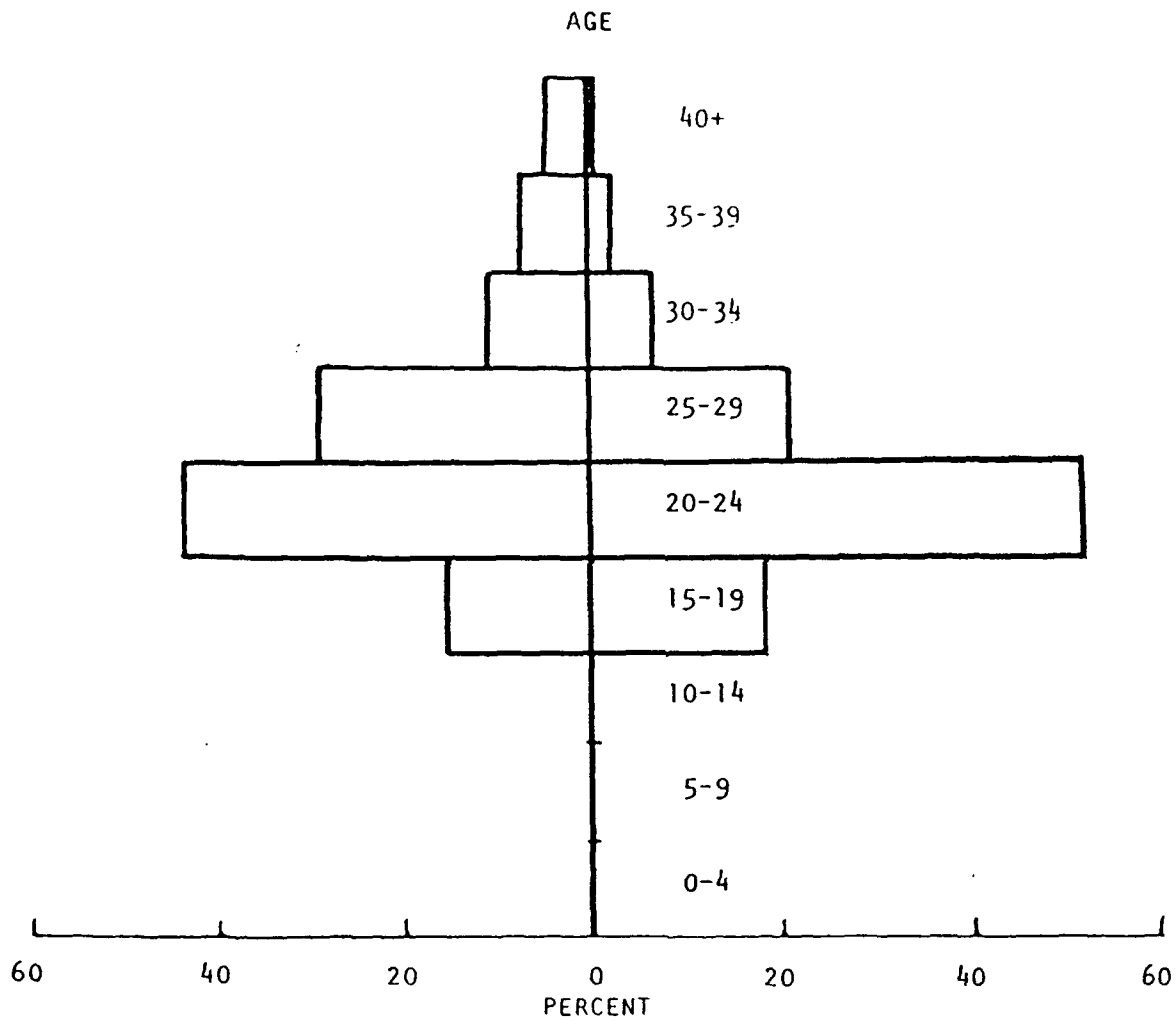


Figure 2.  
Source: J.M. Rothberg,  
"...Health and Effectiveness  
of Women in the Armed Forces"  
AFEB, FtDetrick, 21 Jun 1984

SEX	Mortality Rate (per 100,000 population)		SMR
	Observed US Army	Expected US Civilian	
Male	118.9 (4.4)#	230.2 (6.1)	0.52*
Female	68.0 (10.5)	79.9 (11.3)	0.85
Total	114.3 (4.1)	216.6 (5.7)	0.53*

# Standard Error of the Mean

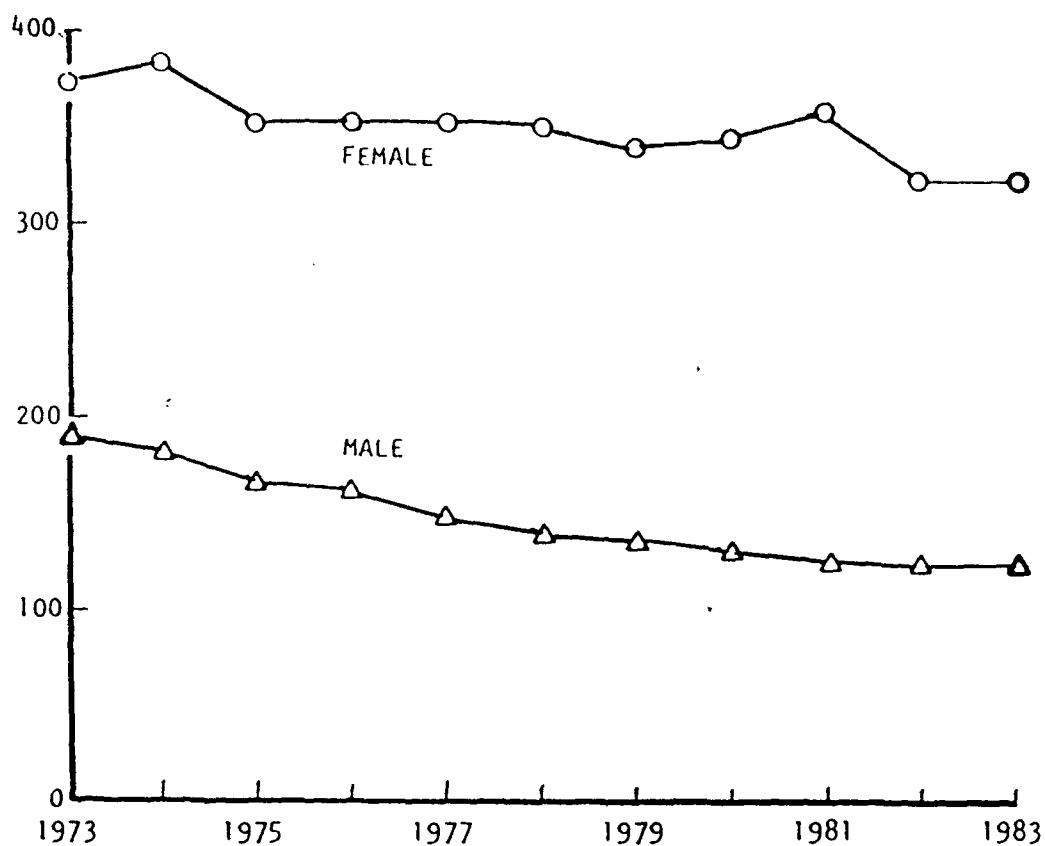
\* significant (P LT .05)

#### UNITED STATES ARMY AND CIVILIAN STANDARDIZED MORTALITY RATIO BY SEX

Observed Army age, sex and race distribution applied to 1978 civilian life tables to yield expected rate, and standardized mortality ratio (SMR).

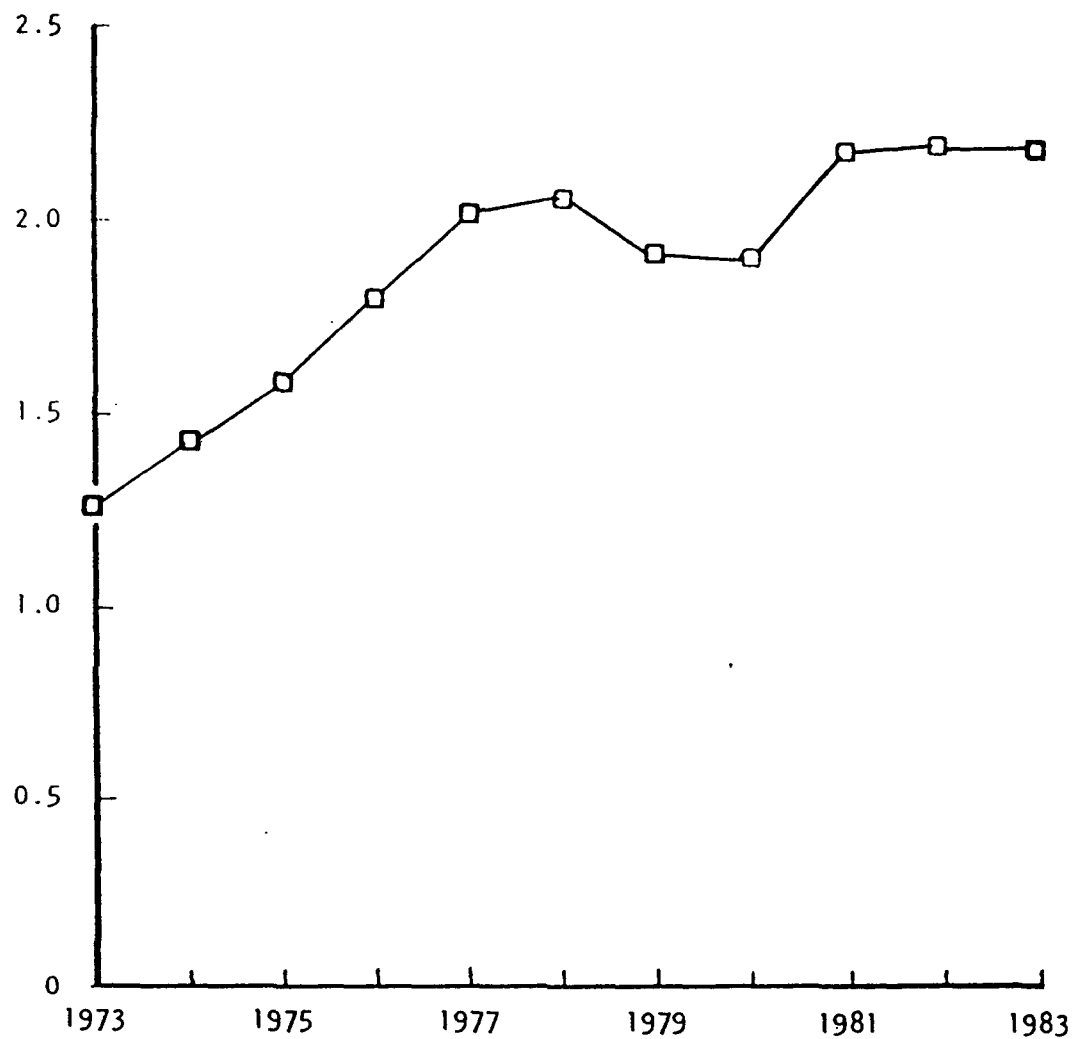
**Figure 3**  
**Source: J.M.Rothberg,**  
**"...Health and Effectiveness**  
**of Women in the Armed Forces"**  
**AFEB, FtDetrick, 21 Jun 1984**





US ARMY ENLISTED HOSPITAL DISPOSITION RATE BY SEX WORLDWIDE,  
ALL DISEASES AND INJURIES (DISPOSITION RATE PER 1000 STRENGTH).

Figure 4  
Source: J.M. Rothberg,  
"...Health and Effectiveness  
of Women in the Armed Forces"  
AFEB, FtDetrick, 21 Jun 1984



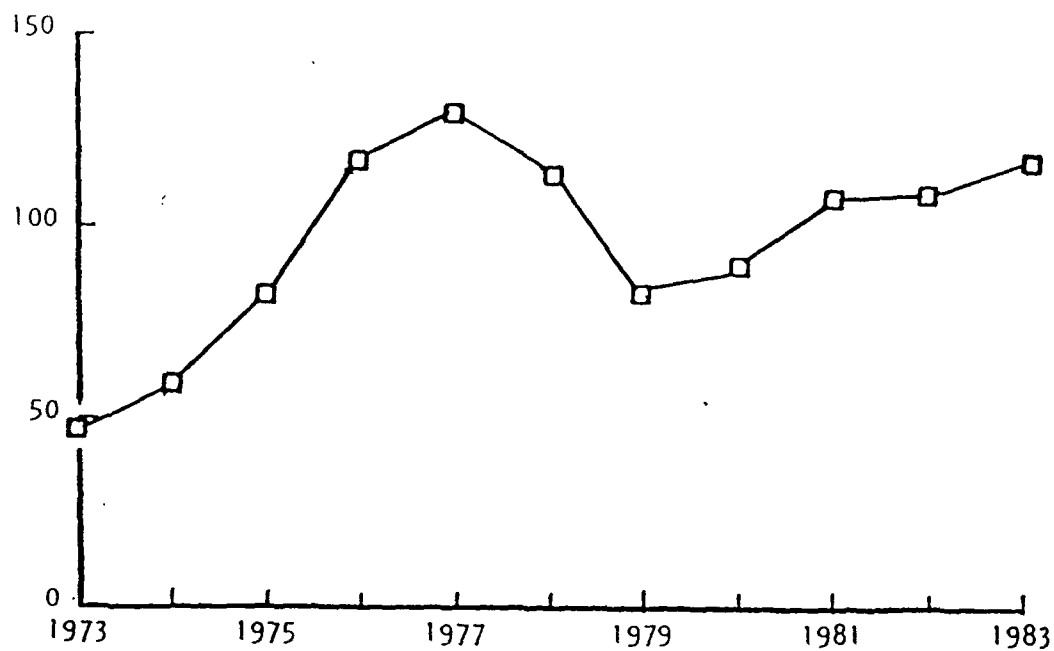
US ARMY ENLISTED HOSPITAL NONEFFECTIVENESS WORLDWIDE SEX RATIO,  
ALL DISEASES AND INJURIES (FEMALE DAILY AVERAGE NUMBER ON HOSPITAL  
ROLLS PER 1000 DIVIDED BY MALE DAILY AVERAGE).

Figure 5  
Source: J.M. Rothberg,  
"...Health and Effectiveness  
of Women in the Armed Forces"  
AFEB, FtDetrick, 21 Jun 1984

CATEGORY (ICD9)	MALE	FEMALE	DIFFERENCE	RATIO
COMPLICATIONS OF PREGNANCY, CHILDBIRTH AND THE PUERPERIUM (630-676)	na	110.5	110.5	inf
DISEASES OF GENITOURINARY S. (580-629)	4.6	39.8	35.2	8.7
DISEASES OF RESPIRATORY S. (460-519)	27.4	40.7	13.3	1.5
ADMISSIONS WITHOUT ILLNESS (V01-V82)	3.5	13.3	9.8	3.8
SYMPTOMS, ILL-DEFINED, UNK (780-799)	4.4	11.8	7.4	2.7
INFECTIVE/PARASITIC (001-139)	7.8	13.8	6.0	1.8
DIGESTIVE SYSTEM (520-579)	12.7	18.1	5.4	1.4
MENTAL DISORDERS (290-319)	11.4	15.3	3.9	1.3
NEOPLASMS (140-239)	1.4	5.3	3.9	3.8
MUSCULOSKELETAL/CONNECTIVE (710-738)	12.9	16.7	3.8	1.3
NERVOUS SYSTEM/SENSE ORGANS (320-389)	3.7	6.2	2.5	1.7
SKIN AND SUBCUTANEOUS (680-709)	4.6	5.7	1.1	1.2
ENDOCRINE/NUTR/METABOLIC (240-279)	1.1	2.1	1.0	1.9
BLOOD/BLOOD FORMING ORGANS (280-289)	0.5	1.2	0.7	2.4
CONGENITAL ANOMALIES (740-759)	0.7	1.2	0.5	1.7
CIRCULATORY SYSTEM (390-459)	4.3	2.8	-1.5	0.7
ACCIDENTS/POISONINGS/VIOLENT (800-899)	26.0	21.2	-4.8	0.8
TOTAL	127.0	325.7	198.7	2.6

US ARMY ACTIVE DUTY ENLISTED HOSPITAL DISPOSITIONS, 1982 (ANNUAL RATE PER 1000)

Figure 5A.  
Source: J.M.Rothberg,  
"...Health and Effectiveness  
of Women in the Armed Forces"  
AFEB, FtDetrick, 21 Jun 1984



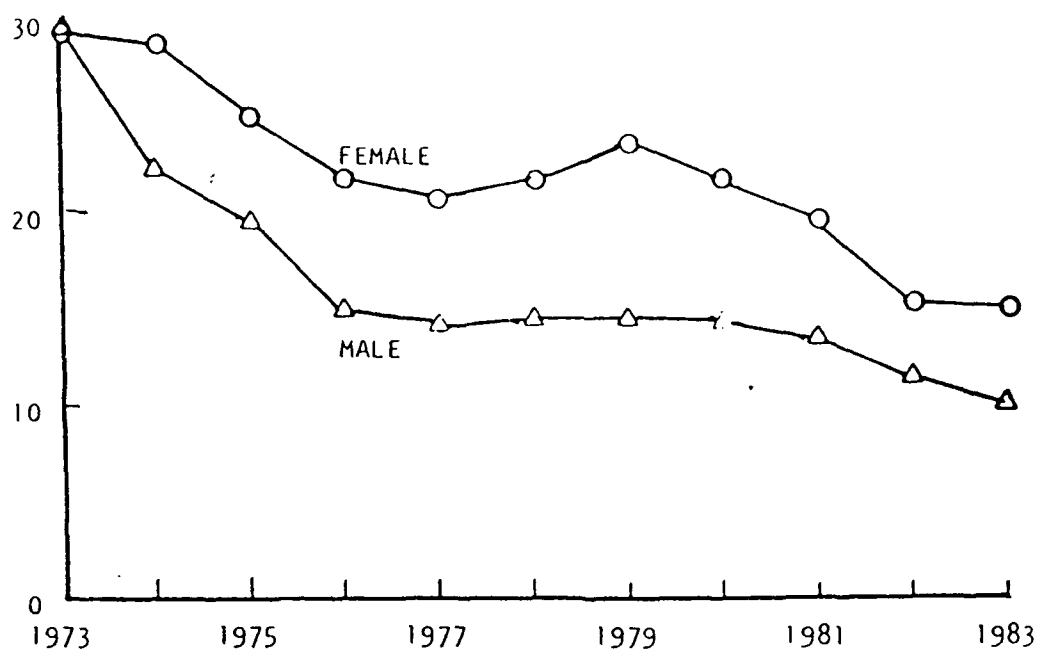
US ARMY ENLISTED HOSPITAL DISPOSITION RATE WORLDWIDE, CHILD~~B~~IRTH  
AND PREGNANCY RELATED (DISPOSITION RATE PER 1000 FEMALE STRENGTH).

Figure 6  
Source: J.M. Rothberg,  
"...Health and Effectiveness  
of Women in the Armed Forces"  
AFEB, FtDetrick, 21 Jun 1984

MILITARY OCCUPATIONAL SPECIALITY	FEMALES ASSIGNED (n=1274)	CHILDBIRTH/ PREGNANCY RELATED	
0 SPECIAL ASSIGNMENT	9.2%	6.0	NON-TRADITIONAL
1 TACTICAL OPERATIONS	0.1%	---	
2 MSSL & FR CNTRL ELECT	2.7%	5.9	NON-TRADITIONAL
3 GEN ELECT MNTNC	9.8%	6.4	NON-TRADITIONAL
4 PRECISION MNTNC	2.8%	5.6	NON-TRADITIONAL
5 AUXILLIARY SRVC	6.4%	5.0	NON-TRADITIONAL
6 MOTORS	13.0%	4.2	NON-TRADITIONAL
7 CLERICAL	24.0%	9.5	TRADITIONAL
8 GRAPHICS	0.3%	---	
9 GENERAL TECHNICAL	<u>30.0%</u>	<u>9.6</u>	TRADITIONAL
	100.0%	7.8	

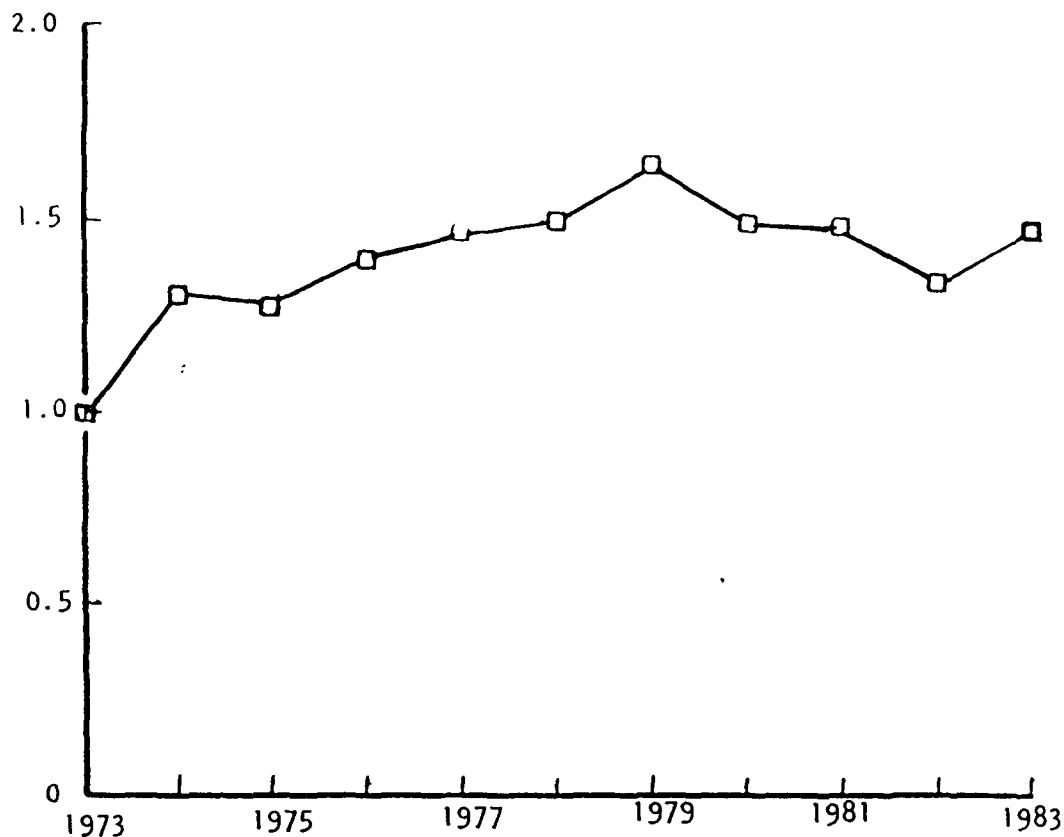
US ARMY JUNE 1977 ENLISTED FEMALES, 1978 HOSPITAL DISPOSITION RATE  
WORLDWIDE, CHILDBIRTH AND PREGNANCY RELATED (DISPOSITION RATE PER 100  
FEMALE STRENGTH).

Figure 7  
Source: J.M.Rothberg,  
"...Health and Effectiveness  
of Women in the Armed Forces"  
AFEB, FtDetrick, 21 Jun 1984



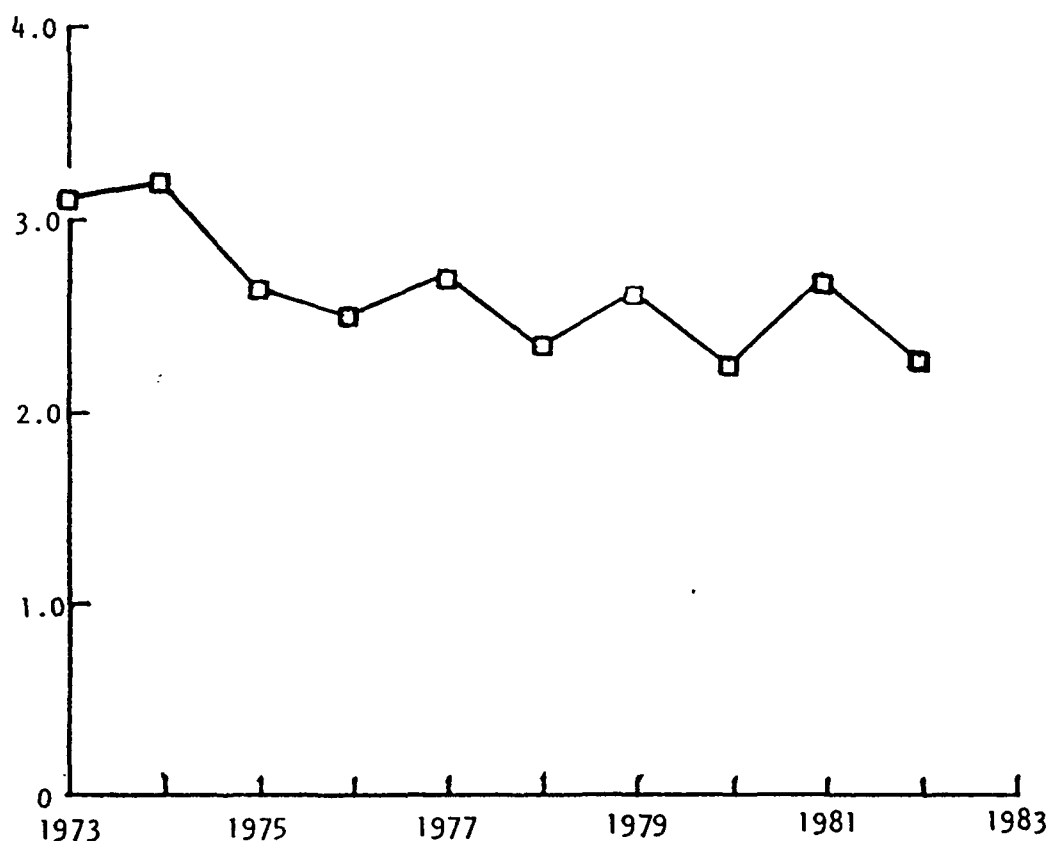
US ARMY ENLISTED HOSPITAL DISPOSITIONS WORLDWIDE BY SEX, MENTAL DISEASE (DISPOSITION RATE PER 1000 STRENGTH).

Figure 8  
 Source: J.M. Rothberg,  
 "...Health and Effectiveness  
 of Women in the Armed Forces"  
 AFEB, FtDetrick, 21 Jun 1984



US ARMY ENLISTED HOSPITAL DISPOSITION WORLDWIDE SEX RATIO,  
MENTAL DISEASES (FEMALE DISPOSITION RATE PER 1000 FEMALE  
STRENGTH DIVIDED BY MALE DISPOSITION RATE PER 1000 MALE STRENGTH).

Figure 9  
Source: J.M. Rothberg,  
"...Health and Effectiveness  
of Women in the Armed Forces"  
AFEB, FtDetrick, 21 Jun 1984



US ARMY ENLISTED HOSPITAL WORLDWIDE SEX RATIO, TRANSIENT  
SITUATIONAL DISTURBANCE (1973-1979) AND ADJUSTMENT REACTION  
(1980- ), (FEMALE DISPOSITION RATE PER 1000 FEMALE STRENGTH  
DIVIDED BY MALE DISPOSITION RATE PER 1000 MALE STRENGTH).

Figure 10  
Source: J.M. Rothberg,  
"...Health and Effectiveness  
of Women in the Armed Forces"  
AFEB, FtDetrick, 21 Jun 1984